

# Extinction, de-extinction and conservation: a dangerous mix of ideas

Peter B. Banks and Dieter F. Hochuli

School of Life and Environmental Sciences

The University of Sydney, NSW 2006

## ABSTRACT

Preventing extinction is the central driver of almost all conservation action. Conservation biologists are sensitive about extinction because it is final and irreversible. The concept of de-extinction however threatens the finality of extinction to offer the option to reverse some of the iconic extinction events. Here we explore the place that extinction plays in conservation and argue that; (1) deliberate extinction by humans is surprisingly rare and extinction is a cultural taboo, (2) Australia has an acute sense of extinction guilt linked to our world renowned extinctions of iconic mammals and; (3) extinction, like death, is irreversible, meaning that extinct species hold a special martyr-like status as iconic consequences of the excesses of humans. We argue that de-extinction is a dangerous idea for conservation because it will undermine the value provided by extinct species as martyrs for the conservation cause.

**Key words:** extinction, de-extinction, passenger pigeon, mammoth, rewilding, thylacine

DOI: <http://dx.doi.org/10.7882/AZ.2016.012>

## Introduction

Conservation biologists are very sensitive about extinction. Preventing extinction is the central driver of almost all conservation action. Most conservation funding somehow goes towards understanding or removing extinction threats or to recovering endangered species to population sizes that are not vulnerable to stochastic drivers of extinction. Thousands of conservation biologists devote their lives to protecting threatened species from extinction, pulling them out of the extinction vortex whereby small populations tend to get smaller and smaller. And conservation asks society to forgo space and resources to keep threatened species away from extinction. The key reason for this sensitivity about extinction is because it is final and irreversible.

In this context, enthusiasm for the prospect of de-extinction (e.g. Lunney 2013) makes sense. De-extinction is the new term to describe the resurrection of recently extinct species using genetic technology to recreate lost wildlife. Given that extinction is such a profoundly bad thing, de-extinction would seem to be a logical solution to this problem.

The recent announcement that the genetic material of extinct gastric-brooding frogs *Rheobatrachus silus* was resurrected, albeit briefly, was heralded by many as a breakthrough for conservation (Cohen 2014). The genetic material of Pyrenean Ibex *Capra pyrenaica pyrenaica* has also been resurrected for a few minutes (Ogden 2014) and attempts are underway to apply genetic technology to resurrect some of the most iconic extinct species that have been lost in recent times at the

hand of humans, including passenger pigeons *Ectopistes migratorius*, thylacines *Thylacinus cynocephalus* and mammoths *Mammuthus* sp. (Sherkow and Greely 2013).

De-extinction has its critics (Sandler 2013; Sherkow and Greely 2013) who question what is to be gained should tadpoles of the gastric-brooding frog swim again. There are questions about whether such individuals would, and could, ever be returned to the wild. Even if they are, it is not clear what ecosystem function is being returned that had been lost - science only knew the species for a few years, too little to know much about its basic biology let alone its ecology. There are also questions about the welfare and future of cloned individuals, forever doomed to inbreed, which is ironic given that inbreeding is a significant extinction risk. Then there are the questions about what is to be gained from resurrecting other, long-lost entities should someone somewhere want to invest in them - these are ethically murky waters.

In this paper we take a different approach and explore some of the ways in which conservation biology treats extinction. This paper thus augments the anthropological exploration of the cultural value of loss and extinction by van Dooren and Rose (2015) in this issue. We contextualize an Australian conservation perspective on extinction, examine how conservation is compelled to prevent extinction, and discuss how deliberate extinctions are exceedingly rare because, in general, humans don't want extinction because of its finality. In doing so we aim to highlight that

## Extinction, de-extinction and conservation

extinction plays a prominent role in conservation science and argue that the extinct are martyrs for the broader conservation cause. De-extinction threatens the martyr status of these extinct wildlife, which we suggest is ultimately a dangerous idea for conservation.

### Australia's extinction guilt

Australia has an acute sense of extinction guilt, perhaps because too many of our unique mammal species have been lost (Johnson 2006). Every Australian biology student will know that Australia holds the world record for mammal extinctions - 19 species lost on the mainland since European settlement, representing almost half of the total known world mammal extinctions over the same time period (Johnson 2006). All of these extinctions of Australian mammals are in some way linked to human involvement, whether by introducing alien species, removing habitat, changing land use or burning regimes - in each case humans are ultimately to blame (Johnson 2006).

There are few more potent examples of human impact on wildlife than the extinction of the thylacine. It is a contemporary story of demise that has been told many times; the thylacine was hunted to extinction by humans for money, either because money was being lost from the livestock that thylacines killed or because money could be made from a bounty on the thylacine's head. Some argue that disease was to blame, but more likely a suite of human induced stressors, including hunting, habitat

loss, and the introduction of dogs all contributed to the thylacine's demise (Sleightholme and Campbell 2015). The ghostly footage of the last surviving thylacine is haunting (Figure 1) (Sleightholme and Campbell 2014); this odd creature, familiar but uniquely Australian, paces around the Hobart zoo. But the last ditch attempts to protect it had come just as the last known individual died (although indirect evidence of thylacine presence continued for many years (Sleightholme and Campbell 2015). Conservation biologists, ourselves included, can't help but feel guilty for the preeminent role that humans played in the loss of this iconic animal. Extinction is so profound an event that it represents a benchmark in conservation, a threshold for the signal of human excesses. The loss of the thylacine is such a significant benchmark, largely because humans essentially hounded it to extinction because it was getting in our way and our regret for this impact came too late to save it. Indeed, most papers on de-extinction inevitably mention the plight of the thylacine as the flagship example of human-induced extinction.

Australia has lost species in other taxa too, including nine species of birds, four frogs, one fish, nine ferns, one invertebrate, 37 flowering plants and one species of algae (EPBC Act 1999). Compared to mammals, these non-mammalian extinctions represent lower proportions of species lost per taxa in Australia and losses for the different taxa globally. However, they are likely to be underestimates (Regnier *et al.* 2015).



**Figure 1:** The last captive Thylacine, 1933. Photo: David Fleay (Sleightholme and Ayliffe 2013)

***Deliberate extinction: a step too far?***

Because extinctions are irreversible (for now), deliberately causing extinction has long been a cultural taboo, at least in modern developed countries (Pleasants 2015). Humans have inadvertently caused the extinctions of hundreds of species via the so called "evil quartet" of extinction forces - introduced species, over harvesting, habitat loss and co-extinction (Diamond 1989). Each of these forces is inevitably associated with human activities. Yet there are surprisingly few clear examples where humans collectively have purposely set out to annihilate a species entirely, and succeeded. Although some individual humans undoubtedly do their best to wipe out particular species that get in their way, collectively humans do not set out to annihilate entire species. For most of the iconic examples of modern extinctions, such as the passenger pigeon, the great auk *Pinguinus impennis*, and the thylacine, protections (or attempts at protection) were put in place to arrest the declines, although these came too late to prevent the inevitable. "Buttons" was the last passenger pigeon seen in the wild before it was shot on March 24 1900 by 14 year old Press Clay Southworth (Staley 2003). Yet Press did not know that it was the last wild passenger pigeon - at 70 years of age he recounted not knowing what species of bird he was shooting at (Staley 2003). Despite the pigeon's widespread violent persecution, there was a common perception that the species, which once numbered in the billions, could not die out completely. One rare case of successful deliberate extinction might be the Falkland Island Wolf *Dusicyon australis*. The species was collected with great ease by Charles Darwin on his voyage on The Beagle, but it was purposefully annihilated through hunting and poisoning to extinction because of its predation on sheep, with no evidence of any attempts to prevent this (Austin et al. 2013). Yet most historic extinctions at the hands of humans have not been due to purposeful attempts at extirpation, but more often neglect, ignorance and bad management.

Future extinction is also an inevitable consequence of strategies of conservation prioritization, but would it be considered deliberate extinction? Proponents of the triage approach to conservation have called for conservation to abandon efforts to rescue doomed species and divert scarce conservation resources to preventing declines (Bottrill et al. 2009 a,b). They argue that it is illogical to devote the most conservation resources to the most threatened species, but instead devote it to ensuring other species don't become more threatened. The potential consequences of this approach are controversial given that some species will inevitably go extinct when costly human intervention is removed (Jachowski and Kesler 2009). The triage approach to conservation is touted as economic rationalism, and any consequent extinctions are inadvertent rather than deliberate, although this is debatable. Arguably, this economic rationalist perspective could be extended to deliberately kill the last individual of a doomed, resource draining species in order to improve the prospects of other

species. For example, there are possibly only three northern white rhinos *Ceratotherium simum cottoni* left anywhere in the world and they soak up enormous amounts of conservation effort to try to protect and resurrect the species, resources that could be better spent elsewhere. However, it is hard to imagine widespread support for calls that humans should intervene and hasten the demise of such a doomed species in order to make better use of conservation money because extinction remains a cultural taboo that is difficult to abandon.

Deliberately causing extinction is considered by some to be a moral crime that even precludes humans from causing the extinction of species that have been the scourge of humanity. The small pox virus *Variola major* has been on death row for years, but persists, kept in two secret locations; one in Russia, one in the USA (Weinstein 2011). It has had four stays of execution and it seems we cannot cause the deliberate extinction of this species. This virus has killed millions of humans, causing an agonizing death in the infected (Koplow 2003). If ever there was one species worthy of extinction in the collective eye of humanity it would have to be small pox, and yet crossing that line still seems a step too far (Koplow 2003, 2004). Some arguments against extinction of small pox are utilitarian ones that consider future needs for vaccines against an unknown resurgence (Henderson 1982). Yet there is a view that small pox, like any species, has intrinsic rights of existence such that state-sanctioned forced extinction is morally wrong. The Royal Society ran a questionnaire of 437 visitors to the Royal Society's Summer Science Exhibition 2009 (RSPB 2009). They found that 61% of the respondents said "No, we cannot cause the extinction of smallpox" and yet if ever there was a species that we might wipe out, it would surely be that one. Either way - the view of extinction is the same - one with irreversible consequences.

***The extinct as martyrs for the conservation cause?***

Because extinction is final, species that go extinct at the hands of human have become, in many respects, martyrs for the conservation cause. Every cause needs its icons, they need rallying points, they need symbols that characterize the cause, and symbols that die can become an even stronger rallying points for the cause, in a sense they become a form of martyr for the cause. In conservation, the extinct are iconic symbols of the cause and they serve conservation very well as proxies for the consequences of extinction agents. In the same way that conserving habitat for wide-ranging "umbrella" species like wolves *Canis lupus* and pandas *Ailuropoda melanoleuca* can protect sympatric species (e.g. see Sergio et al. 2006), extinct martyr species highlight the consequences of extinction threats which directs action to prevent these threats impacting other, extant species. The MEMO (Mass Extinction Monitoring Observatory) project proposes to honour the extinct as martyrs for the conservation cause in a stone monument as a shrine of extinction on the Isle of Portland, where the process of extinction was first recognized (www.





**Figure 2:** Pop art thylacine after Gerard Malanga's 1968 *Che Guevara* in the style of Andy Warhol

memoproject.org). This type of honoring is part of a moral narrative of extinction and is used to send a powerful message about human excess (Minteer 2014). Similarly, we argue that extinct species are integral to our ecological conscience, which is itself central to conservation efforts (see Lunney *et al.* 2013).

As van Dooren and Rose (2016) eloquently reveal, we mourn loss, whether of individuals or indeed of species, and that mourning changes behaviors. We don't want history to repeat. So there's been a vigorous (if mainly vocal) response to a new wave of mammal loss in northern Australia (Woinarski *et al.* 2011), and rapid concern and action taken on the recent appearance of red foxes *Vulpes vulpes* in Tasmania (Fisher *et al.* 2011). We argue that it is the loss of the thylacine, and the 18 other Australia mammals now extinct, that prompts this action. Their extinct status is valued - not just in terms of their value as a John Gould painting, but as icons and martyrs - to motivate us to never let it happen again (Figure 2). It seems like any student talk, research paper or conservation action involving mammals feels the need to name some of the martyrs and quote Australia's extinction record from last century as a central rationale for their research or actions. More recently, the presumed loss of the Christmas Island pipistrelle *Pipistrellus murrayi*, invoked sharp rebuke from Flannery (2012) to Australia in allowing a contemporary extinction to happen under our watch.

What then happens to our conservation symbols if de-extinction succeeds? The genetic techno-fix solution

by de-extinction promises to address the failures of ecological approaches to conservation, and is appealing to many (Delord 2014). Ironically though, de-extinction nonetheless threatens the status of our extinct martyrs for the conservation cause. As such, we argue that de-extinction is a dangerous idea for conservation. How will conservation argue against over hunting when the thylacine, that icon of overhunting, is resurrected? How will conservation argue against habitat loss when that icon of habitat loss (and overhunting), the passenger pigeon is reborn? We agree with other critics of de-extinction (e.g. Sandler 2013; van Dooren and Rose 2015; Minteer 2014) that resurrecting extinct species (once achieved) will undermine conservation efforts because it can be used as an ultimate offset for any environmental impact, however false this hope might prove to be (Sandler 2013). Some argue that de-extinction will promote conservation by being a rallying point behind a great technological achievement (Brand 2014). But without its extinct martyrs like the thylacine, the passenger pigeon, and the gastric brooding frog, conservation will lose its ability to argue against some of the key threats to wildlife and hence lose its voice in the fight against human impacts on the natural world.

## Acknowledgements

We thank Jenna Bytheway for the comments on a draft of this manuscript and for helping to create popart thylacine. We also thank the Australian Museum for approval to use the thylacine photo.

## References

- Austin, J. J., Soubrier, J., Prevosti, F. J., Prates, L., Trejo, V., Mena, F. and Cooper, A. 2013. The origins of the enigmatic Falkland Islands wolf. *Nature Communications* 4: 1552. <http://dx.doi.org/10.1038/ncomms2570>
- Brand, S. 2014. The case for de-extinction: why we should bring back the Woolly Mammoth. *Environment* 360 13 Jan 2014.
- Cohen, S. 2014. The ethics of de-extinction. *NanoEthics* 8 165-178. <http://dx.doi.org/10.1007/s11569-014-0201-2>
- Delord, J. 2014. Can we really re-create an extinct species by cloning? A metaphysical analysis . Pp. 22-29 in *The ethics of animal re-creation and modification: reviving, rewilding, restoring* edited by M. Oksanen and H. Siipi. Pgrave Macmillan, London.
- Diamond, J. 1989. Overview of recent extinctions. Pp. 37-41 in *Conservation for the Twenty-First Century* edited by D. Western, C. Pearl and M. Name. Oxford University Press, New York.
- Fisher, N., Lee, A., Cribb, J. and Haynes, G. 2011. Public perceptions of foxes and fox eradication in Tasmania. *Australian Zoologist* 35: 576-589. <http://dx.doi.org/10.7882/AZ.2011.010>
- Flannery, T. 2012. *After the Future: Australia's New Extinction Crisis*. Black Inc, Sydney.
- Henderson, D.A. 1982. The deliberate extinction of a species. *Proceedings of the American Philosophical Society* 126: 461-471.
- Jachowski, D.S. and Kesler, D.C. 2009. Allowing extinction: should we let species go? *Trends in Ecology and Evolution* 24: 180. <http://dx.doi.org/10.1016/j.tree.2008.11.006>
- Johnson, C. 2006. *Australia's mammal extinctions: a 50,000-year history*. Cambridge University Press.
- Koplow, D.A. 2003. *Smallpox: the fight to eradicate a global scourge*. University of California Press.
- Koplow, D. A. 2004. Deliberate extinction: Whether to destroy the last smallpox virus. *Suffolk University Law Review* 37: 1-50.
- Lunney, D. 2013. Is a grumpy ecologist an oxymoron? Pp. 95-105 in *Grumpy scientists: the ecological conscience of a nation*, edited by D. Lunney, P. Hutchings and H.F. Recher. Royal Zoological Society of NSW, Mosman, Australia <http://dx.doi.org/10.7882/FS.2013.018>
- Lunney, D., Recher, H. F. and Hutchings, P. 2013. The critical importance of an ecological conscience. Pp 126-138 in *Grumpy Scientists: the Ecological Conscience of a Nation*, edited by D. Lunney, P. Hutchings and H.F. Recher. Royal Zoological Society of New South Wales, Mosman. <http://dx.doi.org/doi/pdf/10.7882/FS.2013.021>
- Minteer, B. 2014. Is it right to reverse extinction? *Nature* 509: 561. <http://dx.doi.org/10.1038/509261a>
- Ogden, L.E. 2014 Extinction is forever... or is it? *BioScience* 64: 469-475. <http://dx.doi.org/10.1093/biosci/biu0>
- RSPB 2009. <https://royalsociety.org/exhibitions/2009/extinction> Accessed 30 October 2013
- Pleasants, N. 2015. The question of the holocaust's uniqueness: was it something more than or different from genocide? *Journal of Applied Philosophy* <http://dx.doi.org/10.1111/japp.12113>
- Régnier, C., Achaz, G., Lambert, A., Cowie, R. H., Bouchet, P. and Fontaine, B. 2015. Mass extinction in poorly known taxa. *Proceedings of the National Academy of Sciences* 112: 7761-7766. <http://dx.doi.org/10.1073/pnas.1502350112>
- Sandler, R. 2013. The ethics of reviving long extinct species. *Conservation Biology* 28: 354-360. <http://dx.doi.org/10.1111/cobi.12198>
- Sergio, F., Newton, I.A.N., Marchesi, L. and Pedrini P. 2006. Ecologically justified charisma: preservation of top predators delivers biodiversity conservation. *Journal of Applied Ecology* 43: 1049-1055. <http://dx.doi.org/10.1111/j.1365-2664.2006.01218.x>
- Sherkow, J.S. and Greely, H.T. 2013. What if extinction is not forever? *Science* 340: 32-33. <http://dx.doi.org/10.1126/science.1236965>
- Sleightholme, S. R. and Ayliffe, N. 2013. *International thylacine specimen database (5th revision)*. DVD-ROM. Master Copy: Zoological Society, London
- Sleightholme, S. and Campbell, C. 2014 The earliest motion picture footage of the last captive thylacine? *Australian Zoologist* 37: 282-287. <http://dx.doi.org/10.7882/AZ.2014.021>
- Sleightholme, S.R. and Campbell, C.R. 2015 A retrospective assessment of 20th century thylacine populations. *Australian Zoologist* in press
- Staley D. 2003. The Passenger Pigeon FAQ. <http://www.reocities.com/dragonraid/birds/pp/ppfaq.txt> accessed 5 Feb 2016
- van Dooren, T. and Rose, D.B. 2016. Keeping faith with the dead: Mourning and de-extinction. *Australian Zoologist* in press <http://dx.doi.org/10.7882/AZ.2014.048>
- Weinstein, R.S. 2011. Should remaining stockpiles of smallpox virus (*Variola*) be destroyed? *Emerging Infectious Diseases* 17: 681. <http://dx.doi.org/10.3201/eid1704.101865>
- Woinarski, J.C., Legge, S., Fitzsimons, J.A., Traill, B.J., Burbidge, A.A., Fisher, A., Firth, R.S., Gordon, I.J., Griffiths, A.D., Johnson, C.N. and McKenzie N.L. 2011. The disappearing mammal fauna of northern Australia: context, cause, and response. *Conservation Letters* 4 192-201. <http://dx.doi.org/10.1111/j.1755-263X.2011.00164.x>